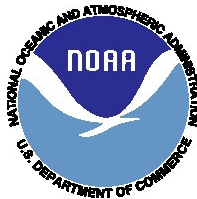


National Core Coastal Indicators Workshop
at
The Conference Center at the Maritime Institute
Linthicum Heights, MD
May 1-2, 2007

REPORT APPENDICES

June 18, 2007

Coastal States Organization, National Oceanic and Atmospheric Administration,
U.S. Environmental Protection Agency



Report Appendices prepared by:

Jennie Harrington and Maggie Mooney-Seus
MRAG Americas, Inc.
65 Eastern Ave, Unit B2C
Essex, MA 01929

Appendix A: Workshop Materials

The following items were distributed to participants at the workshop and are included in this appendix.

- List of Participants
- Agenda
- Federal Panel Summary Table
- Working Group Discussion Table
- Indicator Selection Criteria

List of Participants



National Core Coastal Indicators Workshop
The Conference Center at the Maritime Institute
Linthicum Heights, MD
May 1-2, 2007

Merryl Alber

Associate Professor
University of Georgia
Dept. of Marine Sciences
Marine Sciences Building
Athens, GA 30602
Phone: (706) 542-5966
Email: malber@uga.edu

Sarah Allen

Science Advisor
National Park Service
1 Bear Valley Road
Point Reyes, CA 94956
Phone: (415) 464-5187
Email: sarah_allen@nps.gov

Kacky Andrews

Executive Director
Coastal States Organization
444 North Capitol St. NW
Suite 322
Washington, DC 20001
Phone: (202) 508-3860
Email: kandrews@coastalstates.org

Larry Basch

Science Advisor
National Park Service
Pacific Islands Coral Reef Program
University of Hawaii at Manoa
Honolulu, HI 96822
3190 Maile Way #408
Phone: (808) 956-8820
Email: lbasch@hawaii.edu

Rich Batiuk

Associate Director of Science
Chesapeake Bay Program
EPA - CBPO
410 Severn Avenue
Annapolis, MD 21043
Phone: (410) 267-5731
Email: batiuk.richard@epa.gov

David Bergeron

Executive Director
MA Fishermen's Partnership
2 Blackburn Center
Gloucester, MA 01930
Phone: (978) 282-4848
Email: dbergeron@mass-fish.org

Paul Bertram

Environmental Scientist
EPA
Great Lakes National Program Office
77 West Jackson Blvd.
Chicago, IL 60604
Phone: (312) 353-0153
Email: bertram.paul@epa.gov

Sarah Brace

Science Liason
Puget Sound Action Team - WA
P.O. Box 40900
Olympia, WA 98504
Phone: (320) 725-5464
Email: sbrace@psat.wa.gov

Valerie Brady

University of Minnesota, Duluth
Natural Resource Institute and MN Sea Grant
5013 Miller Trunk Hwy.
Duluth, MI 55811
Phone: (218) 720-4353
Email: vbrady@umn.edu

Suzanne Bricker

NOAA - NCCOS
Center for Coastal Monitoring and Assessment
1305 East West Hwy, Station 9205
Silver Spring, MD 20910
Phone: (301) 713-3020 X139
Email: suzanne.bricker@noaa.gov

Rob Brumbaugh

Restoration Program Director
TNC Global Marine Initiative
URI Narragansett Bay Campus
South Ferry Road
Narragansett, RI 02882
Phone: (401) 874-6870
Email: rbrumbaugh@tnc.org

Barb Buckland

Indicators and Reporting Specialist
Environment Canada - Knowledge and Integration
Division
70 Cr  mazie, 7th floor
Gatineau, QC K1A 0H3
Canada
Phone: (819) 994-0406
Email: barb.buckland@ec.gc.ca

Barry Burgan

U.S. EPA
1200 Pennsylvania Ave., 4504T
Washington, DC 20460
Phone: (202) 566-1242
Email: burgan.barry@epa.gov

Lael Butler

Environmental Scientist
U.S. EPA
Gulf of Mexico Program
Building 1100, Room 232
Stennis Space Center, MS 39529-6000
Phone: (228) 688-1576
Email: butler.lael@epa.gov

Ralph Cantral

Chief, Nat'l Policy and Evaluation Div.
NOAA OCRM
1305 East-West Highway
Silver Spring, MD 20910
Phone: (301) 563-7118
Email: ralph.cantral@noaa.gov

Bob Chen

Professor
UMass Boston
100 Morrissey Blvd.
Boston, MA 02125
Phone: (617) 287-7491
Email: bob.chen@umb.edu

Daniel Cheney

Director
Pacific Shellfish Institute
120 State Ave. NE #142
Olympia, WA 98501
Phone: (360) 754-2741
Email: cheney@pacshell.org

Kimberly Cole

Environmental Scientist
Delaware Coastal Programs
Div. of Soil and Water Conservation
5 East Reed Street, Suite 201
Dover, DE 19901
Phone: (302) 739-9283
Email: kimberly.cole@state.de.us

Tracy Collier

Director, Env. Conservation Div.
NWFSC, NOAA Fisheries
2725 Montlake Blvd E.
Seattle, WA 98112
Phone: (206) 860-3312
Email: Tracy.K.Collier@noaa.gov

Michael Connor

Executive Director
San Francisco Estuaries Institute
7770 Pardee Lane
Oakland, CA 94621
Phone: (501) 746-7359
Email: mikec@sfei.org

Rita Curtis
Division Chief
Economics & Social Analysis
NOAA Fisheries
1315 East West Hwy.
Silver Spring, MD 20910
Phone: 301-713-2328 x 110
Email: rita.curtis@noaa.gov

Braxton Davis
Director, Science and Policy
Ocean and Coastal Resource Management
SC Department of Health and Environmental Control
1362 McMillian Ave. Suite 400
Charleston, SC 29405
Phone: (843) 953-0246
Email: davisbc@dhec.sc.gov

Gary Davis
Ocean Branch Chief
U.S. National Park Service
1849 C St, NW
Washington, DC 20240
Phone: 805-658-5707
Email: gary_davis@nps.gov

Michele Dionne
Research Director
Wells National Estuarine Research Reserve
342 Laudholm Farm Road
Wells, ME 04090
Phone: (207) 646-1555 x136
Email: dionne@wellsnerrcec.lib.me.us

Virginia Engle
Ecologist
U.S. EPA (ORD/NHEERL/GED)
1 Sabine Island Dr.
Gulf Breeze, FL 32561
Phone: (850) 934-9354
Email: engle.virginia@epa.gov

Marjorie (Maggie) Ernst
Environmental Protection Specialist
NOAA OCRM
1305 East-West Highway N/ORM
Silver Spring, MD 20910
Phone: 301-563-7111
Email: Marjorie.ernst@noaa.gov

Kim Frashure
Ph.D. Student
University of Massachusetts Boston
100 Morrissey Blvd.
Boston, MA 02125
Phone: (978) 920-1857
Email: kfrashure@comcast.net

Scott Gende
Coastal Ecologist
National Park Service
Glacier Bay Field Station
3100 National Park Road
Juneau, AK 99801
Phone: (907) 364-2622
Email: scott_gende@nps.gov

David Gordon
U.S. Fish and Wildlife Service
Branch of Habitat Restoration
4401 N. Fairfax Drive, Suite 412
Arlington, VA 22203
Phone: (703) 358-2025
Email: david_gordon@fws.gov

Holly Greening
Senior Scientist
Tampa Bay Estuary Program
100 8th Ave. SE
St. Petersburg, FL 33701
Phone: (727) 893-2765
Email: hgreening@tbep.org

Sami Grimes
Program Analyst
NOAA/OAR/Sea Grant
1315 East-West Highway
Silver Spring, MD 20910
Phone: (301) 734-1077 X1073
Email: Sami.Grimes@noaa.gov

John Haines
Program Coordinator
USGS
12201 Sunrise Valley Drive, MS 915B
Reston, VA 20192
Phone: (703) 648-6422
Email: jhaines@usgs.gov

Jennie Harrington

Fishery Biologist
MRAG Americas, Inc.
65 Eastern Ave., Unit B2C
Essex, MA 01929
Phone: (978) 768-3880
Email: jennie.harrington@mragamericas.com

Mike Hemsley

Deputy Director for Operations
Ocean.U.S.
2300 Clarendon Blvd., Suite 1350
Arlington, VA 22201
Phone: (703) 588-0187
Email: m.hemsley@ocean.us

David Herrera

Fisheries Policy Representative
Skokomish Tribe (WA)
N. 80 Tribal Center Rd
Skokomish, WA 98584
Phone: (360) 877-2100 X201
Email: dherrera@skokomishlegal.net

Elizabeth Hertz

Senior Planner
Maine Coastal Program
38 State House Station
Augusta, ME 04333
Phone: (207) 287-8935
Email: elizabeth.hertz@maine.gov

David Keeley

Policy and Development Coordinator
The Keeley Group
Gulf of Maine Council
710 Augusta Road
Jefferson, ME 04348
Phone: (207) 549-3598
Email: david@thekeeleygroup.com

Richard Kool

Associate Professor, Environmental Education and
Communication Program
Royal Roads University
2005 Sooke Road
Victoria, BC Canada V9B 5Y2
Phone: (250) 391-2523
Email: rick.kool@royalroads.ca

Christian Krahforst

Staff Scientist
Massachusetts Bays NEP
251 Causeway St.
Boston, MA 02114
Phone: (617) 626-1216
Email: christian.kranforst@state.ma.us

Becky Lameka

Program Specialist
Great Lakes Commission
2805 S. Industrial Hwy., Ste 100
Ann Arbor, MI 48104
Phone: (734) 971-9135
Email: blameka@glc.org

Elizabeth Lee

Program Analyst
NOAA OCRM
506 Woodwind Ct.
Kirksville, MO 63501
Phone: (240) 205-4562
Email: elizabeth.lee@noaa.gov

Henry Lee II

Marine Ecologist
U.S. EPA. ORD, Western Ecology Division
Coastal Ecology Branch
2111 SE Marine Science Drive
Newport, OR 97365
Phone: (541) 867-5001
Email: lee.henry@epa.gov

Rhonda Loh

Acting Chief of Natural Resources
Hawaii Volcanoes National Park
National Park Service
P.O. Box 52
Hawaii National Park, HI 96718
Phone:
Email: rhonda_loh@nps.gov

Lynn Martin

Environmental Planner
USACE, Institute for Water Resources
7701 Telegraph Road
Alexandria, VA 22315-3868
Phone: 703-428-8065
Email: lynn.r.martin@iwr01.usace.army.mil

Gary Matlock

Director, NCCOS
1305 East-West Highway, SSMC4
Silver Spring, MD 20910
Phone: (301) 713-3020 X183
Email: gary.c.matlock@noaa.gov

Kay McGraw

Fishery Biologist
NOAA Restoration Center
1315 East-West Hwy.
SSMC-3, F/HC-3
Silver Spring, MD 20910
Phone: (301) 713-0174 X202
Email: kay.mcgraw@noaa.gov

Emily Menashes

Deputy
NOAA Ecosystem Goal Team
1315 East-West Hwy.
Silver Spring, MD 20910
Phone: (301) 713-9075 X164
Email: emily.menashes@noaa.gov

Mark Messersmith

Research Specialist
Ocean and Coastal Resource Management
SC Department of Health and Environmental Control
1362 McMillan Ave. Suite 400
Charleston, SC 29405
Phone: (843) 953-0858
Email: messermj@dhec.sc.gov

Maggie Mooney-Seus

Consultant
Fort Hill Associates
42 Fort Hill Ave.
Gloucester, MA 01930
Phone: (617) 947-5323
Email: mmooneys@aol.com

Christine Negra

Research Associate
The Heinz Center
900 17th Street NW, Suite 700
Washington, DC 20006
Phone: (202) 737-6307
Email: negra@heinzctr.org

Jan Newton

Principal Oceanographer
University of Washington, Applied Physics
Laboratory
1013 NE 40th Street
Seattle, WA 98105
Phone: (206) 543-9152
Email: newton@apl.washington.edu

Hans Paerl

Professor
UNC Chapel Hill
Institute of Marine Sciences
3431 Arendell Street
Morehead City, NC 28516
Phone: (252) 726-6841 X133
Email: hpaerl@email.unc.edu

Matt Patterson

South Florida/Caribbean I&M Network Coordinator
National Park Service
18001 Old Cutler Road Ste. 419
Palmetto Bay, FL 33157
Phone: (305) 252-0347
Email: matt_patterson@nps.gov

Linwood Pendleton

Associate Professor, UCLA
Environmental Health Science
School of Public Health
Mail to: P.O. Box 9
North Sandwich, NH 03259
Phone: (805) 794-8206
Email: linwoodp@linwoodp.com
Coastal Ocean Values Center
linwoodp@coastalvalues.org

Robert (Beau) Ranheim

Chief Marine Sciences
New York City DEP BWT
Wards Island, NY 10035
Phone: (212) 860-9378
Email: branheim@dep.nyc.gov

Laurie Rounds

Coastal Management Specialist
NOAA, OCRM
1305 East-West Hwy., SSMC4
Silver Spring, MD 20910
Phone: (240) 753-4471
Email: laurie.rounds@noaa.gov

Tricia Ryan

Program Manager
NOAA Coastal Services Center
2234 South Hobson Ave.
Charleston, SC 29405
Phone: (843) 740-1145
Email: tricia.ryan@noaa.gov

Don Scavia

Professor
University of Michigan
440 Church St.
Ann Arbor, MI 48109
Phone: (734) 615-4860
Email: scavia@umich.edu

Joan Sheldon

Research Professional
University of Georgia
Dept. of Marine Sciences
Athens, GA 30602
Phone: (706) 542-1283
Email: jsheldon@uga.edu

Renee Thompson

Policy Analyst
Coastal States Organization
444 North Capitol St. NW
Suite 322
Washington, D.C. 20001
Phone: (202) 508-3860
Email: rthompson@coastalstates.org

Dwight Trueblood

Co-Director
NOAA/Cooperative Institute for Coastal and
Estuarine Environmental Technology
UNH, Gregg Hall, Suite 130
35 Colovos Road
Durham, NH 03824-3534
Phone: (603) 862-3580
Email: dwight.trueblood@noaa.gov

Elaine Vaudreuil

Program Analyst
NOAA – OCRM
1305 East-West Highway, N/ORM7
Silver Spring, MD 20910
Phone: (301) 713-3155 x103
Email: Elaine.Vaudreuil@noaa.gov

Lisa Vaughan

Program Manager
Sectoral Applications Research Program
NOAA Climate Office
1315 East-West Hwy.
Silver Spring, MD 20910
Phone: (301) 734-1266
Email: lisa.vaughan@noaa.gov

Jeff Weber

Special Projects Coordinator
Oregon Coastal Management Program
Dept of Land Conservation and Development
800 NE Oregon St. #18
Portland, OR 97232
Phone: (971) 673-0964
Email: Jeff.Weber@state.or.us

Lauren Wenzel

Acting Director
NOAA National Marine Protected Areas Center
1305 East-West Hwy
Silver Spring, MD 20910
Phone: (301) 713-3100 x136
Email: lauren.wenzel@noaa.gov

Rick Wilson

Coastal Management Coordinator
Surfrider Foundation
P.O. Box 6010
San Clemente, CA 92674-6010
Phone: (949) 492-8170
Email: rwilson@surfrider.org

National Core Coastal Indicators Workshop Agenda

Maritime Institute

May 1- 2, 2007

Linthicum Heights, MD



Day 1 - Tuesday, May 1st

Presentations are to set the stage for Workshop Discussions. Provide synopsis of: 1) Current Issues affecting coastal areas, 2) Current efforts to develop coastal indicators, 3) Current indicators tracked by Federal agencies, and 4) Potential strategies for public outreach.

- | | |
|----------|---|
| 8:00 am | Registration/Coffee/Refreshments |
| 8:30 am | Opening Remarks/Introductions/Purpose of Workshop/Objectives/Definition of “Indicator” and “Coastal Zone”
<i>MRAG, CSO/NOAA/EPA</i> |
| 9:00 am | Presentation: Canadian Experience with Coastal Indicators
<i>Barb Buckland, Environment Canada</i> |
| 9:20 am | Questions/Discussion |
| 9:30 am | Presentation: Emerging Indicators
<i>Hans Paerl, UNC</i> |
| 9:50 am | Questions/Discussion |
| 10:00 am | Presentation: Collecting and Analyzing Socio-Economic Indicators on the California Coast
<i>Linwood Pendleton, UCLA</i> |
| 10:20 am | Questions /Discussion |
| 10:30 am | Break |
| 10:40 am | Presentation: Social Science Research on Effective Communication – How Do We Frame the Issues to Cause Action to Occur
<i>Rick Kool, Royal Roads University, BC</i> |
| 11:00 am | Questions/Discussion |
| 11:10 am | Panel Discussion: Existing Indicators and How Indicators are used by Federal Agencies and Enhancing relationships with State and Non-Government Partners
<i>EPA, NOAA, USFWS, NPS</i> |
| 12:00 pm | Lunch |

- 1:00 pm **Presentation:** Summary of Leading Management Issues Affecting Coastal Areas and Common Coastal Indicators Used to Measure Ecosystem Health – Indicator Table
Elizabeth Lee, NOAA
- Charge to Working Groups**
Maggie Mooney-Seus, MRAG Americas
1. Charge to Working Groups: Revise Draft Indicator Table as needed;
 - Delete, add or revise Management Issues (1 hour)
 - Identify 3 key Management Questions. (1 hour)
 - Delete, add or revise Indicators. Consider appropriateness of emerging indicators. (2 hours)
 2. Identify Primary & Secondary Audiences (e.g., public/Congress).
 Recommend how to explain and disseminate information about condition of coast (1 hour)
- 2:00 pm **Working Group Discussions**
- Discussion to answer Question #1: Revise Draft Table, develop indicators
 - Break (agreed upon in individual Working Groups)
- 5:00 pm **Adjourn for Day**

Day 2 - Wednesday, May 2nd

- 8:00 am **Working Group Check-in, coffee**
- 8:30 am **Working Group Discussions (cont'd)**
 Cont'd Discussion of Question #1
- 9:30 am **Working Group Discussions (cont'd)**
 Discussion to answer Question #2: Identify Primary and Secondary Audiences (e.g., public/Congress), Recommend how to explain and disseminate information about state of the coast.
- 10:30 am **Working Group Presentations (10 minutes each)**
- 11:30 am **Discussion:** Overlapping Issues
- 12:00 pm **Lunch**
- 1:00 pm **Plenary Discussion Continued**
 Prioritization of findings from Working Group Discussions
- 1:30 pm **Presentation** Coastal Condition Report/Target Audience
Barry Burgan, EPA
- Plenary Discussion**
 Suggestions for improving Coastal Condition Report based on findings of each Working Group discussion (e.g., Core Indicators which need to be added, deleted, potential target audiences to be reached and ideas for how to effectively reach them)

- | | |
|---------|--|
| 2:00 pm | Break |
| 2:15 pm | Wrap up <ul style="list-style-type: none">• Identify Next Steps• Timeline for completion• Assignments |
| 3:15 pm | Adjourn |

Federal Panel Summary Table

Agency	Federal Agency Requirements/Requests for Indicator Information from <i>External Partners</i>		
	Indicators/Data collected from Non-Federal Partners (from states, other groups)	Source (e.g. state water quality agencies, national estuary programs)	Frequency of collection (e.g. monthly, annually, every 5 years)
EPA	Environmental indicators measuring the success of each NEP's CCMP	National Estuary Program	every 5 years (proposed)
	Number of habitat acres restored	National Estuary Program	annually
	Condition of estuaries and ocean waters CWA section (305(b))	State Water Quality Agency	biennially
	Impaired estuarine waters CWA (303(d))	State Water Quality Agency	biennially
NOAA	Number of coastal communities that use setbacks, buffers, or public ownership to direct development away from areas vulnerable to coastal hazards (proposed)	State coastal zone management programs	every 5 years
	Number of coastal communities that have a mapped inventory of areas affected by natural coastal hazards (by type) (proposed)	State coastal zone management programs	every 5 years
	Number of acres in coastal zone open for public access (proposed)	State coastal zone management programs	every 5 years
	Miles of shoreline open for public access (proposed)	State coastal zone management programs	every 5 years
	Water quality in national estuarine research reserves - water temperature, water depth, salinity, pH, dissolved oxygen, turbidity	National Estuarine Research Reserve System - System-Wide Monitoring Program (Phase 1)	every 15 minutes from at least 4 monitoring stations per reserve; at least 2 water stations are telemetered to support IOOS near-real time data delivery
	Biological health in national estuarine research reserves - chlorophyll a (ongoing), SAV monitoring (ongoing), emergent vegetation monitoring (ongoing); nekton monitoring (in development); invasive species monitoring (in development)	National Estuarine Research Reserve System - System-Wide Monitoring Program (Phase 2)	at least 16 reserves have completed biomonitoring of SAV/Emergent communities since 2004; repeated sampling occurs as appropriate for the reserves

Agency	Federal Agency Requirements/Requests for Indicator Information from <i>External Partners</i>		
	Indicators/Data collected from Non-Federal Partners (from states, other groups)	Source (e.g. state water quality agencies, national estuary programs)	Frequency of collection (e.g. monthly, annually, every 5 years)
NOAA Cont.	Nutrients in national estuarine research reserves - ammonium, nitrate, nitrite, ortho-phosphate	National Estuarine Research Reserve System - System-Wide Monitoring Program (Phase 1)	at least monthly sampling at 2 water quality monitoring stations per reserve
	Atmospheric conditions in national estuarine research reserves- air temperature, wind speed and direction, relative humidity, barometric pressure, rainfall/precipitation, and photosynthetically active radiation (PAR)	National Estuarine Research Reserve System - System-Wide Monitoring Program (Phase 1)	every 15 minutes from at least 1 weather station at each reserve
	Habitat and watershed mapping and land use change analysis - within boundary of each NERR; within watershed in which each NERR is located	National Estuarine Research Reserve System - System-Wide Monitoring Program (Phase 3)	repeated mapping dependent on CSC's CCAP, which supplies regular habitat maps every 3-5 years
NPS	Number and distribution of Marine Protected Areas	state resources agencies	
	Number of businesses and amount of revenue generated in coastal counties dependent on ocean parks	National Park and Conservation Association	approximately annually
	Number of oil and other hazardous substance spills	state resource agencies	annual?
	Nearshore currents	state resource agencies	continuous
	Water quality at recreational beaches	state water quality programs	

Agency	Indicator Information Collected <i>Internally</i> by Federal Agencies		
	Indicators/Data collected by Federal agencies	Source (e.g. agency program name, monitoring program name)	Frequency of collection (e.g. monthly, annually, every 5 years)
EPA	National Coastal Assessment Indicators (Water Quality, Sediment Quality, Fish Tissue, Benthic Condition and Habitat Loss)	National Coastal Assessment through States	Completed in 2006, start as 106 grants in 2010, every 5 years thereafter (tentative)
NOAA	Coastal population trends (current, rate of change, density, projected growth in coastal counties)	U.S. Census; NOAA Spatial Trends in Coastal Socio-economics	annual or every 10 years, dependent on parameter
	Coastal economic trends (percent change in value of coastal tourism and recreation; percent national economy attributable to coastal counties)	National Ocean Economics Project	approximately annually
	Coastal employment trends (percent of national employment in coastal counties; percent employment/number businesses dependent on coastal and ocean resources)	National Ocean Economics Project	approximately annually
	Proportion of Federal Disaster Declarations occurring in coastal areas/directly related to coastal hazards	FEMA	annually
	Total estimated cost of all billion-dollar weather disasters related to coastal hazards	FEMA	annually
	Percent land cover change in coastal areas	NOAA Coastal Services Center - Coastal Change Analysis Program	every 5 years
	Percent impervious land cover	NOAA Coastal Services Center - Coastal Change Analysis Program/USGS/NASA	5 years
	Coastal topography and bathymetry from lidar	NOAA Coastal Services Center - Topographic Change Mapping Project, NOAA/USACE Joint Airborne Lidar Technical Center, State Partners	5 years (CONUS)

Agency	Indicator Information Collected <i>Internally</i> by Federal Agencies		
	Indicators/Data collected by Federal agencies	Source (e.g. agency program name, monitoring program name)	Frequency of collection (e.g. monthly, annually, every 5 years)
NOAA Cont.	Extent/change in coastal wetlands	NOAA Coastal Services Center - Coastal Change Analysis Program	every 5 years
	Benthic habitat mapping (including SAV)	NOAA Coastal Services Center	
	Coral reef status and condition - benthic habitat characteristics, water/substrate quality, associated biological community structure	National Coral Reef Ecosystem Monitoring Grant Program	
	Regional and national trends in chemical contaminants in shellfish	Mussel Watch Project	
	Regional and national trends in chemical contaminants in sentinel species of marine mammals and coastal birds	NOAA/Few coastal states/USFWS/USGS	
	Biological effects associated with chemical contamination	Bioeffects Assessment Project	
	Spatial extent of contaminated sediment in estuaries, coastal bays and the coastal ocean and within NOAA-managed areas	NOAA/Few coastal states/EPA/USGS	
	Spatial extent of coastal ecosystem impairment due to toxic contamination as determined by the Sediment Quality Triad approach	NOAA/Few coastal states/EPA	
	Spatial extent of estuaries and coastal bays that experience recurrent hypoxic conditions (oxygen levels below 2 mg/L) or do not meet other specified criteria established by coastal states	NOAA/Coastal states/Several federal agencies	
	Incidence and spatial extent of harmful algal blooms	NOAA/Few coastal states/EPA/Academia	
	Number of estuaries with symptoms of eutrophication	NOAA/Few coastal states/EPA/Academia	

Agency	Indicator Information Collected <i>Internally</i> by Federal Agencies		
	Indicators/Data collected by Federal agencies	Source (e.g. agency program name, monitoring program name)	Frequency of collection (e.g. monthly, annually, every 5 years)
NOAA Cont.	Benthic macroinvertebrate diversity changes	NOAA/Few coastal states/EPA/Academia	
	Change in the spatial extent of impervious areas in coastal watershed	NOAA/Few coastal states/NASA/USGS	
	Flux of contaminants from the watershed to the coastal ocean	NOAA/Few coastal states/USGS	
	Percent of coastal shorelines included under states' stormwater management programs	NOAA/Coastal States/EPA	
	Percentage of shellfish growing areas closed to harvest	NOAA/Coastal states	
	Percentage of "coastal beach miles" affected by advisories and closures	NOAA/Coastal states/EPA	
	Fish tissue contaminants index for ecologically important fish species	NOAA/Few coastal states/EPA/USGS	
	Levels of mercury in edible fish filets for species with commercial, subsistence and recreational value	NOAA/Few coastal states/EPA/USGS	
	Number of protected species designated as threatened or endangered with stable or increasing population levels	NOAA Fisheries - Office of Protected Resources	annually
	Fish Stock Sustainability Index (Using a set of 230 commercially and recreationally managed fish stocks, tracks knowledge about the status, fish harvest rates and biomass, and the outcome of building and maintaining fish stocks at productive levels)	NOAA Fisheries - Office of Sustainable Fisheries	quarterly
	Commercial fish and shellfish landings	NOAA Fisheries - Office of Science and Technology	monthly/annually
	Economic impacts from recreational fishing	NOAA Fisheries - Office of Science and Technology	

Agency	Indicator Information Collected <i>Internally</i> by Federal Agencies		
	Indicators/Data collected by Federal agencies	Source (e.g. agency program name, monitoring program name)	Frequency of collection (e.g. monthly, annually, every 5 years)
NOAA Cont.	Number and distribution of marine managed areas	NOAA Marine Protected Areas Center and DOI	
	Air deposition - ammonium deposition (wet); ozone, sulfur dioxide, nitric acid (dry)	Atmospheric Integrated Research Monitoring Network	
	Changes in freshwater availability [both surface and groundwater] necessary for maintaining integrity of estuaries and coastal ecosystems (under exploration)	USGS; Very few estuaries with data or approach	
	Spatial extent of degraded or declining coastal wetlands and marshes [wetland fragmentation and patch metrics] (under development)	USFWS; academia; some coastal states	
	Impact of aquatic invasive species on the biodiversity and habitat use in NOAA-managed areas, coral reef ecosystems and estuaries (under development)	Coastal states; USFWS; Smithsonian Institute; NPS; USGS	
	Ecosystem Services Index (under exploration: not yet well articulated; could be similar in approach to the Environmental Sustainability Index)	Academia; Interagency Working Groups	
	Estuarine Trophic Status index "ASSETS"	Academia; Interagency Working Groups	
USFWS	Status & trends of wetlands	National Wetland Inventory	every 5 years
	Status & trends of migratory bird pops.	Migratory Bird Program	annually
	Status & trends of fish populations	Fish and Wildlife Mgt. Assistance	annually for certain species
	Fish barrier/dam data by watershed	Fish Passage Program	continuous
	High-priority marine mammals	Marine Mammals Management	annually for certain species
	High-priority listed species	Endangered Species Program	varies by species, region, and state

Agency	Indicator Information Collected <i>Internally</i> by Federal Agencies		
	Indicators/Data collected by Federal agencies	Source (e.g. agency program name, monitoring program name)	Frequency of collection (e.g. monthly, annually, every 5 years)
NPS	Number and distribution of areas of special protection or MPAs	NOAA/DOI	every 1-3 years
	Annual visitation to NPS visitor centers at Ocean Parks	NPS by ocean park	annually
	Number of oil and other hazardous substance spills	DOI/DOC	annually
	Habitat fragmentation - Percent land cover change in coastal areas	DOI-NPS Technical Information Center and National Inventory and Monitoring Program	proposed every 5 years
	Shoreline Change; shoreline vulnerability index	USGS/NPS - LIDAR	proposed every 3-5 years
	Nearshore currents	State - federal IOOS	realtime continuous; in place at several locations
	Water quality at recreational beaches	State-federal collaboration; DOI -NPS Technical Information Center and National Water Resources Program	Seasonally
	Species, biodiversity trends and distribution, and ecosystem condition (kelp forest, coral reef, intertidal community, birds, marine mammals)	DOI-NPS Technical Information Center and National Inventory and Monitoring Program	Annually depending on indicator
	Federal listed Species trends and distribution	DOI-NPS & FWS with NOAA	Annually depending on indicator
	Soundscape	NPS	continuous in certain ocean parks
	Air Quality	NPS - Air Resources Division	continuous in certain ocean parks

Agency	Indicator Information Collected <i>Internally</i> by Federal Agencies		
	Indicators/Data collected by Federal agencies	Source (e.g. agency program name, monitoring program name)	Frequency of collection (e.g. monthly, annually, every 5 years)
USGS	Bio-indicators of environmental health and condition, including biochemical, physiological, species, and biotic community measures	USGS Status and Trends Program, Freshwater, Terrestrial, and Marine Ecosystems Program	
	Physical and chemical indicators of water availability, use, and quality	USGS Cooperative Water Programs	
	Indicators of climate history and climate change	USGS Earth Surface Dynamics Program, Coastal and Marine Geology Program, Freshwater, Terrestrial, and Marine Ecosystems Program	
	Indicators of changing shorelines, land use, and land cover	USGS Geographic Analysis and Monitoring Program, Coastal and Marine Geology Program	
Multi-agency	IOOS core variables - salinity, temperature, sea level, surface waves, surface currents, heat flux, bathymetry and bottom character, sea ice, dissolved nutrients (N, P, Si) dissolved oxygen, chemical contamination, fish species and abundance, zooplankton species and abundance, phytoplankton species and abundance, optical properties, waterborne pathogens	Ocean.U.S.	

Working Group Discussion Table

Working Group #	Working Group 1 - Pollution Indicators				
	Issues	Management Questions	Common Indicators (across regional and national efforts)	Possible Additional/Emerging Indicators	Proposed Core Indicators
WORKING GROUP # 1	Water quality	How is coastal water quality changing over time?	Dissolved oxygen/hypoxia		
		Is the water quality of recreational beaches in compliance with designated beneficial uses?	Chlorophyll concentrations		
		What is the extent of eutrophication in coastal waters?	N and P concentration and loadings		
		What is the extent of sediment loading in coastal waters?	Water quality		NCCR water quality index (N, P, DO, chlorophyll a, water quality)
			Harmful algal blooms		
	Contamination	How is the level of contamination in seafood changing?	Toxins in shellfish	Contaminants in marine mammals	
		How is the level of contamination in coastal areas changing?	Shellfish bed closures		
		What are emerging pollution issues such as new contaminants?	Toxins in sediment		NCCR sediment quality index - sediment toxicity, contamination, and TOC
		What are the point and non-point pollution sources?	Toxins in fish		NCCR fish tissue contaminant index
			Contaminants in birds		

Working Group #	Working Group 1 - Pollution Indicators, Cont.				
	Issues	Management Questions	Common Indicators (across regional and national efforts)	Possible Additional/Emerging Indicators	Proposed Core Indicators
WORKING GROUP # 1 Cont.	Air quality	How is atmospheric deposition in coastal areas impacting coastal resources?		Air pollutants concentration in coastal environments	
		How is air quality affecting viewsheds in coastal areas?		Acid rain	
		How are dark night skies affected by coastal anthropogenic light sources?		Visibility	
				Measurements of color, brightness, intensity and sources; indirect measures of disturbance to wildlife	

Working Group #	Working Group 2 - Land/Water Interface Indicators				
	Issues	Management Questions	Common Indicators (across regional and national efforts)	Possible Additional/Emerging Indicators	Proposed Core Indicators
WORKING GROUP #2	Coastal development	What is the type and rate of land use change in coastal areas?	Land use		
			Impervious surfaces		
			Protected lands		
			Undeveloped/unfragmented blocks of land		
			Brownfield redevelopment		
	Coastal hazards	How is coastal storm frequency and intensity changing?	Extent of hardened shoreline	Population in high hazard areas	
		What is the extent of erosion along coasts?	Coastal erosion	Economic costs from hazard events	
		What is the extent to which coastlines and nearby areas have been altered?		Extent and type of coastal hazard events	

Working Group #	Working Group 3 - Biological and Physical Indicators				
	Issues	Management Questions	Common Indicators (across regional and national efforts)	Possible Additional/Emerging Indicators	Proposed Core Indicators
WORKING GROUP #3	Habitat	How is the extent and distribution of coastal habitats changing over time?	SAV coverage	Coral reef coverage	
		How is habitat quality changing over time?	Wetland coverage	Marine protected area coverage	
			Habitat distribution and coverage	Percentage of native species or native species diversity	NCCR coastal habitat index (from NWI)
			Distribution and number of non-native species		
	Species	What is the status of and trends in key coastal species?	Bird diversity and abundance	Algal and invertebrate communities	NCCR benthic diversity index
		How is species diversity and abundance in coastal areas changing over time?	Fish stocks	Marine mammal diversity and abundance	
		What is the extent of invasive species in coastal areas?	Species at risk		
		What is the status of and trends in threatened and endangered coastal species?	Distribution and number of non-native species		

Working Group #	Working Group 4 - Climate Change Indicators				
	Issues	Management Questions	Common Indicators (across regional and national efforts)	Possible Additional/Emerging Indicators	Proposed Core Indicators
WORKING GROUP #4	Climate change	How is climate change impacting water temperatures and circulation patterns?	Sea surface temperature	Ice duration on the Great Lakes	
		How is climate change impacting coastal habitats?		Extent of sea level rise	
		How is climate change impacting coastal human communities?		Changes in number and length of ENSO events	
		How is climate change affecting the frequency and intensity of ENSO events?		Changes in number and intensity of hurricanes	
		How is climate change affecting seasonal upwelling patterns?		Changes in seasonal upwelling	
		How is climate change affecting species distribution patterns?			
		How is climate change affecting nearshore coastal currents?		Coastal nearshore currents changes	

Working Group #	Working Group 5 - Social and Economic Indicators				
	Issues	Management Questions	Common Indicators (across regional and national efforts)	Possible Additional/Emerging Indicators	Proposed Core Indicators
WORKING GROUP #5	Population and employment	How is the coastal population changing?	Population growth	National economy/employment attributable to coastal counties	
		How is the coastal economy changing?	Population rate of change	Number of coastal dependent businesses in coastal counties	
			Population density	Total employment in marine sector	
		Social and Economic Indicators	Local marine resource use patterns		
	Human Uses: Recreation and tourism	What is the extent and type of public access ways in coastal areas?	Beach closures	Park usage (# of visitors)	
		What are the economic benefits from coastal tourism and recreation?	Public access points	Public satisfaction with recreation experience	
		What are the impacts of recreation on coastal resources, including wildlife activities?		Recreational fishing economic impacts	
				Tourism dollars spent in coastal counties	
				Recreational water quality	
				Number and extent of piers and marinas	
				Number and extent of moorings and anchoring vessels	
				Nesting/roosting seabird colonies; seal colonies, migrating whales	

Working Group #	Working Group 5 - Social and Economic Indicators, Cont.				
	Issues	Management Questions	Common Indicators (across regional and national efforts)	Possible Additional/Emerging Indicators	Proposed Core Indicators
WORKING GROUP #5 Cont.	Commercial fisheries and aquaculture	What is the status of and trends for key commercial fish species?	Commercial fish and shellfish landings	Nesting/roosting seabird colonies; seal colonies, migrating whales	
		What is the extent and types of aquaculture facilities in coastal areas?		Distribution and areal coverage of eel grass beds, subtidal habitat substrates	
		What are the impacts of fisheries and aquaculture activities on coastal resources, including habitats, wildlife activities, and invasive species introduction?		Distribution and number of introduced non-native species	
		What is the economic benefit from commercial fisheries and aquaculture?			
	Oil and gas	What is the extent of oil and gas exploration and extraction from coastal areas?	Number and extent of oil and gas leases	Nesting/roosting seabird colonies; seal colonies, migrating whales	
		What is economic benefit from oil and gas extraction?			
		What are the impacts from oil and gas exploration on coastal resources, including habitats and wildlife activities?			

Working Group #	Working Group 5 - Social and Economic Indicators, Cont.				
	Issues	Management Questions	Common Indicators (across regional and national efforts)	Possible Additional/Emerging Indicators	Proposed Core Indicators
WORKING GROUP #5 Cont.	Transportation	What is the extent and types of port facilities in coastal areas?	Number, type, and extent of ports		
		What is the economic benefit from port activities?			
	Military Activities	What are the impacts from military activities on coastal resources, including habitats and wildlife activities?		Nesting/roosting seabird colonies; seal colonies, migrating whales	
	Cultural history	What is the types and protection status of key cultural resources in coastal areas?		Marine protected area coverage	
	Aesthetic value	How is air quality affecting viewsheds in coastal areas?	Level of understanding of human impacts on resources	Visibility	
		Are wilderness values preserved in congressionally designated wilderness areas?		Natural sounds, natural lights	
				Green Accounting: non-market valuation	

Indicator Selection Criteria

The following are recommended criteria to use when choosing core indicators. Please discuss and modify within your working group discussion:

1. The indicator is measurable
2. It is feasible to collect and analyze the data to support the indicator
3. The data is replicable and credible
4. The indicator represents an important ecological/socio-economic role of the ecosystem
5. The indicator is important in guiding management decisions and conditions 1-4 above are also met

Appendix B: Working Group Summaries

Group 1 – Pollution Indicators

Working Group Chair: Barry Burgan, EPA

Working Group Participants: Merryl Alber (Univ. of Georgia), Sarah Allen (NPS), Paul Bertram (EPA), Sarah Brace (Puget Sound Action Team), Suzanne Bricker (NOAA-NCCOS), Tracy Collier (NWFSC), Mike Connor (SFEL), Braxton Davis (South Carolina OCRM), Marjorie Ernst (NOAA-OCRM), Christian Krahforst (Mass Bays NEP), Hans Paerl (UNC-Chapel Hill), Laurie Rounds (NOAA-OCRM), Joan Sheldon (Univ. of Georgia), Renee Thompson (CSO), Dwight Trueblood (NOAA/CICEET)

Working Group Summary

The group began by discussing whether the management issues provided (water quality, contamination and air quality) were appropriate. It was decided that the Coastal Water and Land Quality, Contaminants, and the Air Quality are good issues with which to tell the story; but when developing management questions and indicators, Coastal Water and Land Quality was consolidated under the heading of Water Quality. Land based pollution was briefly discussed as stemming from superfund sites, hazardous waste areas and redeveloped industrial areas which generate toxins, nutrients, sediments and microbial bacteria. Air quality was not discussed at length, although a few indicators were developed, as the group lacked expertise in this area.

The group stressed that even though they were discussing national indicators, data should be gathered and reported on a regional or local basis. For example, hypoxia might be a huge problem on the coasts, but not in the Great Lakes, which could skew the national average. To deal with such issues, a parallel structure for freshwater and saltwater could be used in the reports as there are different metrics and only some issues in common. Existing documents from NOAA and the EPA could be used as a starting point, but would have to be revised and expanded.

When discussing how to approach the task of defining management questions, the group agreed to discuss general questions rather than specific sub-questions. The rationale behind this decision was that for national decision makers, it is irrelevant where 'X' beach is impaired. However, managers must be able to break the data down into regional or local summaries in order to address some issues. In addition, in some cases, grouping two or more indices is important to provide a broader picture of ecosystem health. Indices help to provide the big message while individual indicators tell a more complex story.

Key Issues

- Coastal water and land quality (Focus on water quality)
- Contaminants
- Air quality

Key Management Questions

Water Quality

- How is coastal water quality changing over time?
- What are the symptoms? (e.g., enhanced production, hypoxia)
- Where is water quality a problem and what do we need to do to improve it?
- Is water quality sufficient or high enough to support ecosystem and human uses?
- Are things getting better or worse with management actions?
- Where is water quality high enough for human use and ecosystem function?
- Negative spin: Where is water quality degraded so that it can no longer support human use and ecosystem function?

Contaminants

- Are contaminants affecting seafood safety and environmental quality?
- Is the nation's seafood safe to eat?

Air Quality

- What is the status of the nation's air quality?
- What are the sources of pollution to coastal water?
- How does air quality affect the quality of coastal waters?
- How do air pollutants relate to water quality?
- What is the direct human impact on air quality?
- What are sources of pollution, loading and amount of atmospheric deposition?

Common and Emerging Indicators

Water Quality

- Percent of impaired water bodies in the coastal zone (not adequate, beach and shellfish closures are better)
- Drinking water quality
- Percent and number of beach closures
- Hypoxia
- Harmful algal blooms
- Shellfish closures
- Fish contamination
- Bird egg contamination
- Marine mammal contamination

Contaminants

- Indicators with an existing national database: Benthic Triad (emerging), benthic community and toxicity
- Eutrophication Index (e.g., loss of eelgrass beds, chlorophyll-a)
- Submerged aquatic vegetation (regional concern)
- Chlorophyll-a and dissolved oxygen
- Hypoxia
- Nutrient levels (e.g., measure hypoxia, harmful algal blooms and loads)
- Fish contaminants
- Bird egg contamination
- Beaches (e.g., swimming health)
- Shellfish bed closures
- National Coastal Assessment Index (nitrogen, pH, dissolved oxygen, water clarity)
- What are the merits of a eutrophication index versus a water quality index?
- Total nutrients versus loads
- Total nitrogen and total phosphorus (difficult to measure due to non-point source runoff. Not clear that there is sufficient monitoring of tributaries to adequately measure – could be a data gap?)

Air Quality

- NPS has a classification to determine whether national parks are meeting air quality standards (haze, ultraviolet index, etc.)
- Number of coastal states, counties, cities, airsheds maintaining air quality standards or ozone action days
- Loads per unit area of: phosphorus, NO_x (e.g., ammonia, organic nitrogen), mercury, hydrocarbons, visibility, ultraviolet light (elevated UV warnings could come from exceedences index), photosynthetically active radiation, ground level ozone

Emerging Contaminant Indicators

- Plastic debris (e.g., marine debris, coastal clean up)
- Ecosystem integrity (e.g., benthic index, reproduction, biodiversity, endangered and invasive species)
- Stormwater runoff
- Energy production
- Waste treatment facilities
- Transportation
- Nanotechnology (e.g., chemical contaminants)
- Indicators that would show how “my management” is affecting these issues would resonate with the general public
- Number of volunteers and weight of trash collected at the Ocean Conservancy’s International Coastal Clean-up

Core Indicators

Water Quality

- Beaches (e.g., closures, visitation, etc.)
- Impaired waters (303D list, Clean Waters Act)
- Shellfish closures
- Fish contamination
 - Fish consumption advisories
 - Bird egg contaminants
 - Marine mammal contaminants

Contaminants

- Total loadings of nitrogen and phosphorus
- Total nitrogen
- Total phosphorus
- Chlorophyll-a
- Macrophytes
- Dissolved oxygen
- Submerged aquatic vegetation (not useful in Great Lakes)
- Nuisance and toxic algae
- Marine debris
- Ecosystem integrity index
 - Benthic index
 - Reproduction
 - Biodiversity
 - Endocrine disrupters
 - Invasive species

Emerging Contaminant Indicators

- Underwater sound
- Contaminants
 - Plastic pellets
 - Nanoparticles
 - Personal care products

Air Quality

- Number of class 1 parks (air quality rating)
- Exceedences of ozone action days/air quality standards days
- Airshed air quality
 - NOx (e.g., nitrate and nitrite)
 - Reduced nitrogen (e.g., ammonia and ammonium)

- Organic nitrogen
- Phosphorous
- Aromatic hydrocarbons
- Mercury
- Visibility

Emerging Air Quality Indicators

- Ocean acidification
- Ultraviolet exceedance
- Photosynthetically active radiation
- Night light issues
 - Turtle nesting
 - Migratory bird/squid fishery

Target Audience and Methods of Outreach

Primary Audience

- Decision-makers, Congress
 - Congressional staffers
 - State legislatures
 - Regional associates (federal and state agencies, NGOs)

Secondary Audience

- Public

When discussing information dissemination, the group discussed that the one or two sound bytes that would most resonate with the general public were human health and ecosystem health. In addition, the group stressed that it is imperative that some statement be included in the report related to quality assurance to enable all data to be traced back to its original source.

How should we display the data?

- Use maps
- Numbers and scores should be used to express the extent, trends and status as they relate to the indicators
- Review existing reports for displays that work (e.g., NOAA Eutrophication Report and State of the Puget Sound Report)
- A national report card that averages regional scores and a map with a color code would work well for finer scale (e.g., JOCI Report Card)
- Interactive mapping
- Professional communications experts should be utilized in the development and creation of any report
- Give examples of management mechanisms that affect each of the management questions.

Stories

- Utilize case studies (good and bad) to tell the stories
- Emerging issues may be good case study topics to illustrate things that need to be addressed on a management/policy level
- A State of the Great Lakes 2007 report is coming out soon, they are trying to stay away from programs. They are taking an anecdotal approach and have presented some with a positive spin. There are about 144 separate programs in the Great Lakes Region
- Eastern Shore (Chesapeake Bay) and Georgia (coastal development) have innovative monitoring programs (FerryMON, NC)

Group 2 – Land/Water Interface Indicators

Working Group Chair: Kacky Andrews, CSO

Working Group Participants: Valerie Brady (Univ. of MN Duluth), Barb Buckland (Environment Canada), Holly Greening (Tampa Bay Estuary Program), Liz Hertz (Maine Coastal Program), David Keeley (Gulf of Maine Council), Becky Lameka (Great Lakes Commission), Lynn Martin (U.S. ACE), Mark Messersmith (South Carolina OCRM), Matt Patterson (NPS), Elaine Vaudreuil (NOAA-OCRM), Jeff Weber (OR Coastal Management Program)

Working Group Summary

This group was tasked with exploring land/water interface indicators, and evaluated some social and economic factors in addition to environmental conditions as they felt it was necessary to understand the interactions between land and water. They also included submerged lands and watersheds. Even though some areas of certain watersheds might extend further inland than would be considered “coastal” there still could be effects on the coasts and oceans.

The group decided to use the issues that were given to them on the draft indicator table, but they expanded Coastal Development to become Coastal Land Use and Development. From there they developed a set of key management questions for each issue, and a long list of what they considered to be core indicators. A lengthy discussion was held at the end of the working group session about information presentation and dissemination.

Key Issues

- Coastal Hazards
- Coastal Land Use and Development

Key Management Questions

Hazards

- How much development is going into coastal high hazard areas?
- How many communities are built to withstand storms of a given intensity?
- How is development exacerbating vulnerability or exposure to hazards/erosion?
- What are the economic costs due to development in high hazard areas?
- What is the economic value of resources at risk?
- Where are the high risk areas that need to be protected?
- How many people are in harm's way? Is this number increasing or decreasing?

Coastal Land Use and Development

- How is coastal habitat being changed over time by land and water uses?
- What are the impacts of land use impacts on the watershed and water quality?
- What is the effect of coastal development on coastal habitats?
- What level of development is a problem?
- Is the infrastructure being developed in a manner that can sustain coastal resources (e.g., water consumption and land based sources of pollution)?
- What is the current level of land-based sources of pollution and how does that compare with the threshold?
- What level of unfragmented blocks of habitat is needed to support critters or prevent flooding, protect freshwater quality?
- What percentage of water quality impacts are coming from coastal land uses?

Core Indicators

Hazards

- Number of people living in high hazard areas and change over time (i.e., using FEMA floodmaps and the number and extent of hurricanes, tsunamis, erosion hazards and landslides, etc.)
- Number and value of structures in high hazard areas (i.e. use census data)
- Economic value and loss due to hazards in high hazard areas
- Repeat claims for damage
- Number of lives lost or displaced
- Evacuation time
- Storm frequency
- Number and percent of structures damaged
- Public spending in high hazard areas
- Percent of coastline/communities that have enacted hazard mitigation policies
- Number of communities that have adopted setback policies or stronger building codes to reduce vulnerability/risks to coastal hazards
- New insurance policies written within floodplain areas
- Extent and loss (change) of natural features that protect the coast/resources within high hazard areas (e.g., loss of barrier islands, mangroves, primary/secondary dunes, wetlands and presence or absence of seagrass beds)

Coastal Land Use and Development

- Coastal land use/land cover and change over time (including restoration)
 - Impervious surface
 - Natural area loss and gain
 - Rate of land consumption/development footprint
- Submerged and intertidal land use and change
- Habitat quality (i.e., monitor invasive species, fragmentation, connectivity, biodiversity and RTE species)
- Resource quality and quantity
- Sensitivity index – shoreline vulnerability to climate change. (e.g., atlas.nrcan.gc.ca; the “Atlas of Canada” reports on relief, geology, coastal landform, sea-level tendency, shoreline displacement, tidal range and wave height)
- Percent of hardened shoreline
- Natural coastal buffer (e.g., undeveloped dunes and shorelines)
- Infrastructure investments (e.g., amount of infrastructure affected by sea level rise)
- Coastal Livability Index
 - Car miles driven (commuting)
 - Number or type of jobs available for all economic strata
 - Employment income versus investment income
 - Percent of coastal residence in various quartiles of income (affordability)
 - Coastal property values and/or tax assessment (in terms of affordability)
 - Year-round versus seasonal residence (or percent of owner-occupied homes)
 - Distance traveled to natural area/greenspace
- Miles of undeveloped shoreline
- People per acre (value question: which is better, density or rural character?)
- Beach closures (due to water quality problems)
- Visitation and use of coastal areas
- Number of states that require public access
- Tourism

Target Audience and Methods of Outreach

A national report can have an audience at the state and local level, particularly if the indicators are designed to be relevant at various levels. The primary and secondary audiences are listed below.

Primary

National

- Congress
- Administration officials
- Opinion leaders/NGOs

Secondary

Regional

- Governor's Organizations
- Inter-agency groups
- NGOs

State:

- Governors
- Legislators

Local

- Elected Officials
- Planning and Zoning

The working group assumed that all audiences are time limited – the problem statement, pressures and solutions must be condensed into a message with a three minute or 30 second sound byte. It is very important how the message is crafted, because people who do not like the solution might discount the indicator.

Methods of outreach also were discussed. While the stop light approach (good/fair/poor overall and by region) might work, it assumes someone can put a value on these indicators – something that is hardest to tackle at the national level. The group noted that it might be interesting to present a national map with some actual data points, but with the stop light coloring overlaid to display regional variability. Companion documents that point to regional or local data also would be helpful, and a survey of audiences might aid in the determination of which presentation types are most effective.

Group 3 – Biological and Physical Indicators

Working Group Chair: David Gordon, USFWS

Working Group Participants: Larry Basch (NPS), Kimberly Cole (Delaware Coastal Management Program), Gary Davis (NPS), Michele Dionne (Wells National Estuarine Research Reserve), Scott Gende (NPS), Henry Lee II (EPA), Maggie Mooney-Seus (Fort Hill Associates), Beau Ranheim (NYC DEP), Lauren Wenzel (NOAA)

Working Group Summary

Working Group 3 decided to use the table provided as a basis for its discussions. The group recognized the importance of capturing land, wetland and water condition changes. The group discussed the reality that a random sample approach would have to be taken to capture the national change in habitats such as wetlands (e.g., capture percent of wetland loss). It would not be possible to map the entire national shoreline. The NCCR coastal habitat index was cited as a good tool but that it should be expanded to include more than just wetland change (e.g., capture land/water trends and changes).

For monitoring plants and animals, participants agreed that the National Wetlands Inventory is a coarse index which only determines the probability that a particular community is a plant community; it would need to be enhanced or supported by other indicators. Generally, it was thought that diversity was too difficult to measure in the coastal/marine environment because it was scale dependent and diversity in one area may not truly reflect ecosystem functioning. In addition, it is difficult to develop an indicator for biodiversity (do you look at best or worst sites or least impacted sites?). Instead, the focus should be on measuring distribution and abundance of various species. There also was a great deal of discussion about the importance of defining a desirable benchmark or target for what managers are trying to achieve through monitoring efforts as well as clearly articulating what happens when the benchmark is reached. The public needs to understand that the indicator is only one stage in the process – there needs to be continued long-term coastal monitoring and management. It was generally agreed that benthic indicators are a good core indicator because they are sedentary. The group did not include marine protected area coverage as a core indicator even though it was included as a common indicator in the Working Group Discussion Table, because these areas are typically defined for management purposes and may not be representative of the ecosystem. However, the group acknowledged that changes in habitat condition inside and outside of no-take zones would be a reasonable indicator to assess habitat condition.

Key Issues

- Aquatic Habitat (e.g., submerged and emergent benthic vegetation and vegetative and non-vegetative substrate)
- Plants/Animals (e.g., healthy food web)

Key Management Questions

- How are the extent and distribution of coastal habitats changing over time?
- How is habitat quality changing over time?
- What are the status and trends in important coastal species populations?
 - What is the extent of invasive species in coastal areas?
 - What is the status of and trends in threatened and endangered coastal species?
- How do biotic assemblages (i.e., communities) change over time in coastal areas?

Common and Emerging Indicators

Common Indicators

- Extent and distribution of SAV coverage
- Wetland coverage and function
- Habitat distribution and coverage

- Fish stocks
 - Balanced fish assemblage
 - Dominant species assemblages
- Species at risk
- Distribution and number of non-native species
- Invertebrates
- Benthic community assemblages

Emerging Indicators

- Benthic habitat mapping
- Coral reef coverage
- Intertidal habitat (e.g., coverage of mudflats, marsh, salt marsh, seagrass and fresh water), specifically looking at shifts in coastline, spatial and distributional changes.
- Algal and invertebrate communities
- Marine mammal distribution and abundance
- Birds, could pick non-migratory birds
 - Distribution of wading birds
 - Dead seabirds that wash up on the beach
- Algae
- Rugosity
- Surface roughness
- Depth of anoxic layer
- Depth of epipelagic layer
- Sulfides
- Non-vegetative habitat indicator/sediment index

Core Indicators

Habitat

- NCCR coastal habitat index
- Benthic habitat mapping (i.e. measure change through random sample based approach)
- Distribution of non-native species in non-vegetative habitats (i.e., use random sample based approach)
- Benthic habitat condition (e.g., physical and chemical condition of the substrate - region specific)

Plant and Animals

- National Coastal Assessment Benthic Index (e.g., Index of Biotic Integrity and infaunal invertebrates in soft sediments)
- Invertebrate community index (i.e., sample assemblage and community condition)
- Proportion of fish stocks overfished (sampling, two visits, to every site)
- Presence of non-native species (e.g., non-native benthic species – sample using benthic grabs, rapid assessments, need taxonomists, mining databases etc.)
- Fish community indicator (complexity of food web and trophic structure)
- Number of threatened and endangered species (i.e., initially monitor the presence or absence of state and federal species of concern, then monitor status and trends and conduct population assessments)
- Distribution and abundance of macroalgae

Target Audience & Methods of Outreach

Congress, decision makers and the general public. The group did not discuss methods of communicating coastal condition to target audiences.

Group 4 – Climate Change Indicators

Working Group Chair: Ralph Cantral, NOAA-OCRM

Working Group Participants: Richard Batiuk (EPA), Rob Brumbaugh (TNC), Lael Butler (EPA), Bob Chen (UMass Boston), Sami Grimes (NOAA/OAR/Sea Grant), John Haines (USGS), Rhonda Loh (NPS), Gary Matlock (NOAA-NCCOS), Elizabeth Mills Lee (NOAA-OCRM), Christine Negra (Heinz Center), Jan Newton (Univ. of Washington), Lisa Vaughan (NOAA – Climate Program)

Working Group Summary

Working Group 4 started off by discussing how climate change affects the topics discussed by the other working groups. The group also discussed that managers need to know how the climate will be changing, thus long-term data about climate trends is important. In addition to long-term change, it is important to include indicators that will change credibly over the next 10 years. The group concluded that these short-term indicator changes, especially those indicators reflecting changes in species, habitats, and human uses, are needed to keep the interest of the public and managers. It was recognized that multiple factors may cause changes in certain indicators, so we need to focus on indicators that can be more directly linked to climate change.

With climate change still a contentious issue, the working group discussed how indicators do not have to be value-based and can just assess the state. It was also recognized that while the goal of the workshop is to produce national-scale indicators, important indicators such as corals are not applicable to all coastal states. It was concluded that the core indicators must integrate environmental changes and downstream impacts on resources and human uses. The working group acknowledged that indicators from other working groups may be the same as some of the indicators for climate change impacts (e.g. species and habitat changes) and there will be a need to synthesize information across working groups to look for relationships.

The working group noted that information on climate trends is just starting to be collected, but focusing on changes in intensity and variability is a place to start. The working group also determined that documenting climate change is not as important as documenting changes in species that are especially sensitive to changes in their ecosystem (sentinel species). Along the same lines, it is not as effective to map sea level rise as it would be to map vulnerability to sea level rise. We can look at relative sea level rise (e.g. using sea ice), corals (i.e., buffering capacity) and wetlands as indicators.

Key Issue

- Climate Change

Key Management Questions

- What are the impacts of climate change on commercial fisheries?
- What are the impacts of climate change on growing coastal populations?
- What are the impacts of climate change on the timing and magnitude of freshwater flow into estuaries?
- How is climate change impacting weather patterns?
- What are the impacts of climate change on human communities (e.g., sea level rise and coastal storms etc.)?
- What are the impacts of climate change on economic activities?
- What is the impact of human use of coastal areas (e.g., recreational and agricultural etc.)?

Common and Emerging Indicators

Indicators for which climate is a primary driver/signature:

- Level of awareness about climate impacts on coastal resources; (i.e., measured using surveys, planning documents, energy efficient products and services)

- Shellfish disease (e.g., parasite distribution based on temperature and salinity)
- Seagrass/marshgrass (e.g., extent and phenology)
- Riverine input/groundwater levels (e.g. phenology and variability, indicator not measured/available everywhere)
- Sea ice (i.e., measure timing of breakup and extent; amount of shoreline exposure)
- Sentinel species (e.g., quantity and distribution (climate specific), corals (temperature, pH, and disease; reef community structure))
- Ocean acidification – indicator of carbon cycle; could result in coral death due to changes in pH
- Key physical parameters
 - Sea surface temperature
 - Coastal temperature
 - Salinity distribution
 - Circulation/current changes – would want to do on a global cycle, not just U.S. or just coastal so may not be applicable
- Distribution of humans
 - Population in 100 year floodplain
 - Unusual human displacement: from Katrina, other events
- Relative sea level change – not much data currently collected; good indicator but data gaps; may be more understandable to public as storm surge change or coastal inundation; USGS has a coastal vulnerability index but it is very interpretative and right now, it is not likely to change; NPS is discussing how to incorporate sea level rise into planning; relative measure of high/low change
 - Shoreline/beach width: with sea level rise and inundation frequency as two components
- Changes in insurance availability/premiums – How many years into the future are these data useful? It's a measure of perception of risk. May be indicative of how much development we can expect over the next few years, but not necessarily related to climate change. Or, it could be an indicator of the reaction to the perception of climate change by a major industry that affects human behavior. It is an important economic driver. Perhaps it is a measurement of awareness or perception. Many factors affect insurance so it may not be the best indicator over the long-term. May be a short-term leading indicator, not a long-term core indicator.
- Weather (storm frequency/severity; North Atlantic Oscillation and El-Nino Southern Oscillation frequency/intensity)
- Seasonal upwelling
- Carbon storage – measurements taken more in terrestrial ecosystems; less feasible in marine systems to capture carbon in sediment
- Carbon flux from land to ocean – being looked at as a large part of the missing sink of carbon

Indicators with multiple factors as drivers:

- Wetlands/mangroves
- Coastal ecosystem extent (e.g., saltmarsh and mangroves) – maybe not losing wetlands but shifting distribution
- Shifts in biological communities – species on the edge of their salinity or temperature gradients
- Invasive species (distribution)
- Loss in infrastructure
- Changes in populations (displacement)
- Change in fisheries productivity/profit
- Changes in home values
- Changes in recreational uses (e.g., as a result of coral degradation, water quality and waterborne diseases)
- Changes in recreational quality (e.g., waterborne disease outbreaks and beach closures)
- Urban heat island effects – differential between large area and localized urban heat (tie to impervious surfaces); time trend for difference between urban core and surrounding areas

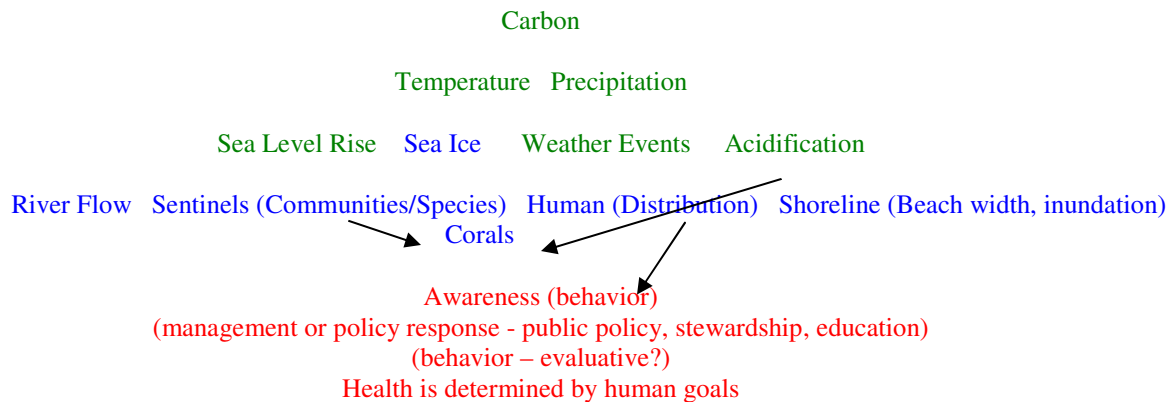
Poor indicator or not discussed:

- Sale of energy efficient products
- Management plans for dealing with climate change
- Number of comprehensive management plans that have climate change or sea level rise as a component
- Heating/cooling cost change

Core Indicators

- Sea ice extent and timing
- Sentinel species – corals (respond to: pH, temp, disease and reef community structure); non-natives
- Fish/shellfish disease – May have multiple impacts; for higher level organisms, the disease may show effects before the temperature change; range of distribution of organisms instead
- Shoreline/beach width
 - Sea level rise
 - Inundation frequency
- Riverine flow input and timing
- Seagrass/marshgrass (e.g., extent and phenology)
- Sea surface temperature, coastal temperature
- Ocean acidification
- Distribution of humans (in key areas a certain distance from the coast)
- Awareness/Response capacity

The group proposed the following hierarchical structure for the core indicator organization:



Description of Hierarchical Diagram

- Green indicators (top 3 lines of diagram with the exception of sea ice) are leading indicators (direct impacts that tell observer to start to expect change); They are more directly linked to climate change
- Blue indicators (fourth row of diagram, including sea ice and corals) are lagging indicators (ecological/human responses to direct impacts); They would see more inter-relationships with other working groups
- Red indicators (bottom four lines of diagram, starting with awareness) would show behavioral responses to trends in other indicators
- Behavior comes from awareness, which is created by the story weaved together using all the other indicators
- Awareness is a method for placing value upon indicators but assumes that your target audience for the indicators is matched to the audience whose behavior you are trying to change

- If managers are the audience, perhaps a useful form of information or an indicator would be related to the effectiveness of management strategies (e.g., management plans) – management or policy response
- Health of the coastal zone is not just about natural resources and the environment but also includes human behavior/human demographics
- Response capacity – resilience, awareness and human responses (voluntary and involuntary) instead of awareness
- Climate change is going to occur – part of a healthy coastal zone; How do we determine what is healthy? Does change in the form of climate change or hurricane intensity mean that the coasts are becoming unhealthy? Need to draw a line between indicators and assessments – indicators track signals while as an assessment is a value statement.

Target Audience and Methods of Outreach

This group did not discuss the target audience, but they had an in-depth discussion about what the message should be and how to disseminate it in order to best affect people's behavior.

Currently, the NCCR primarily reports on biological and physical state. Working Group 5 would like to see it expanded to include other areas and issues. The green indicators (top of the hierarchical diagram) will aid in understanding/supporting climate change models; but for management purposes, the value of the blue indicators (middle of the hierarchical diagram) is important. Blue indicators detect the effects of climate change on people and highlight what is of most important to audience, and they are scaleable to multiple levels. However the blue indicators are lagging so they cannot be used for forecasting, but instead show the ecosystem's response to change, which is why both blue and green indicators are needed.

Further, the group discussed that more information than just the current state of the coast needs to be given. It will be necessary to integrate individual indicators to make an overall statement about how climate change is affecting the coasts. In addition, information on changes that should be made or management actions that should be taken is needed. The group also discussed how, in the face of ecosystems that will inevitably change, there is a need to determine what society wants the ecosystem to look like. With this definition or goal articulated, we will better understand how to judge if, based on indicator trends, a coastal is "healthy." Finally, the group stressed that coastal health is not one-size-fits-all as there are many regional differences.

Group 5 – Human Use Indicators

Working Group Chair: Linwood Pendleton, UCLA

Working Group Participants: David Bergeron (MA Fishermen’s Partnership), Dan Cheney (Pacific Shellfish Institute), Rita Curtis (NOAA), Kim Frashure (UMass Boston), Jennie Harrington (MRAG Americas, Inc.), David Herrera (Skokomish Tribe), Rick Kool (Royal Roads University), Kay McGraw (NOAA Restoration Center), Emily Menashes (NOAA-Ecosystem Goal Team), Tricia Ryan (NOAA-Coastal Services Center), Don Scavia (Univ. of Michigan), Rick Wilson (Surfrider Foundation)

Working Group Summary

Working Group 5 tried to come up with an unambiguous interpretation of indicators, and so chose to focus on human uses that depend on ecosystem health (rather than human uses that affect ecosystem health). For example, ports and oil/gas, etc. will not respond to or be affected by ecosystem health, but they will impact it. Thus, the socio-economic indicators discussed and defined in this working group are still indicators of ecosystem health. There was a comment in the all-group discussion afterward that the scope of the health effects in Working Group 5 seemed narrow. In the future, it might be important to consider lack of access and how that might affect human health along with the health of traditional communities (e.g., when they cannot fish).

Working Group 5 did not use the draft indicator chart that was supplied to them, instead they brainstormed issues, then picked core issues from that list. Once the core issues were decided upon, management questions were developed for each issue. While developing management questions, the group tried to focus on asking the right questions. It is easy to ask the question “How has Indicator ‘X’ changed over time?”, but this is not a management question. The answers to the management questions must tell a story. As such, the group did not spend much time developing the actual indicators, preferring to spend more time on the questions, with the idea that if the right questions are asked, the indicators will be easy to develop. One issue that the group struggled with was aquaculture. Aquaculture is important and growing, but for now the group left it combined with commercial fishing. The group concluded that it might need to be its own separate issue in the future.

Issues

Brainstorm list of all issues

- Population and demographic change
 - Income levels
- Employment (resource dependant) – census level
- Perceptions/attitudes
- Cultural
- Recreational (e.g., diving, boating, swimming and fishing)
- Commercial fishing
- Aquaculture
- Tourism (overnight)
- Subsistence use
- Shipping and transportation
- Agriculture/forestry (e.g., grape vines respond to nutrients transported by salmon migrating from the ocean inland via rivers and streams; also cranberry bogs)
- Desalination
- Drinking water (Great Lakes)
- Housing (first and second homes and rental market)
- Marinas (reflect a lot of other uses)
- Support industries
- Aesthetic

- Public/human health
- Education
- Military
- Oil and gas

Core Issues (ones with the strongest link to human use)

- Population and demographic change
- Employment (e.g., ocean-dependent jobs, use census level data)
- Commercial fishing
- Aquaculture
- Recreational (e.g., diving, boating, swimming, fishing)
- Public/human health
- Housing (first and second homes and rental market)
- Education

Secondary Issues (ones with a more tenuous link to human use)

- Marinas support industries
- Perceptions/attitudes
- Aesthetic
- Tourism (overnight)
- Cultural
- Subsistence use
- Shipping and transportation
- Agriculture/forestry
- Desalination
- Drinking water (Great Lakes)

Tertiary Issues (important but not candidates for core questions)

- The effect of coastal ecosystem health on drinking water (Great Lakes).
- What's the economic contribution of diving and snorkeling (not universally important)?
- Bivalve aquaculture
- Agriculture that depends on coastal ecosystem health
 - Wine growing
 - Cranberries

Key Management Questions

Population

- What proportion of the population lives on the coast because it's the coast?

Employment

- What is the mix of employment opportunities on the coast?
- How has the mix of employment opportunities changed on the coast?
- Average wage (income) by sector?

Commercial Fishing

- Is the fishery sustainable?
- What is the value of coastal fishing? How has it changed?
- How important is domestic commercial fishing to domestic consumption?
- Is there diversity in the fishery (in vessel size and gear type)?
- What is the contribution of commercial fishing to the gross domestic product (employment or sales)
- What are bivalve harvests? (Extremely dependant on water quality)

Recreation

- How important is the coast to Americans?
- What is economic value of coastal recreation?
- Who enjoys these values?

Human Health

- How many people got sick from eating contaminated seafood from the U.S.?
- What are benefits from eating fish (omega 3s)?
- How many people get sick from water contact?
- Illnesses associated with harmful algal blooms (non-consumption)?

Cultural Uses

- How have traditional coastal uses changed (as a result of changes in the coastal ecosystem)?
- How have coastal communities changed (as a result of changes in the coastal ecosystem)?
- How do relationships and shared experience that help facilitate dialogue change? (media stories)
- How have historic cultural resources changed?
- How many people are participating in traditionally managed fisheries?
- How have waterfront uses changed?

Governance and Collaborative Research

- How has the scale of coastal governance changed? (federal/local versus regional)
- How has the consideration/use of local ecological knowledge by the scientific community changed? (how many collaborative research grants have been funded, etc.)
- How has the amount of collaborative research changed?
- How has participation and representation of fishery and fish and game councils changed?

Education

- How have coastal-related research publications changed?
- What is the level of public participation in coastal education?
- How important is the coastal ecosystem for university level research?
- How has K-12 coastal education changed?
- How has the number of collaborative research efforts changed (# non-academic authors, etc.)

Core Indicators

Population

- Coastal population (increasing or decreasing?)

Employment

- Job mix (is it changing?)
- Average Income

Commercial Fishing

- Fishery landings
 - Finfish and Shellfish separate
- Fishery value
- Fishing effort

Recreation

- Number of people go to the coast for recreation each year
- Number of coastal visits each year
- Mix of coastal uses

Human Health

- Number of fish advisory days
- Local seafood consumption (by species)

Education

- Number of publications associated with the coast
- Amount of research funding at coastal institutions
- Attendance at K-12 coastal education centers

Target Audience and Methods of Outreach

Primary

- Executive branch (White House Offices (OMB, CEQ))
- Congressional committee staff
- Agency heads (NOAA, EPA, etc.)

Secondary

- Coastal zone management agencies (state level)
- Marine fisheries councils
- Regional partnerships
- Public (teachers, advocates, concerned citizens, NGOs, media)

People capable of disseminating information and influencing policy

- Media
- Teachers
- Advocates
- NGOs
- Public (need to be informed by media, education, etc.)

What is the message?

- Should we assign value judgment to the indicators? Or just indicate change and let NGOs and others assign the good and bad values.
- There's a program in Oregon called the Scientist and Fishermen Exchange (SAFE), such forums might be a good way to disseminate information.
- In the executive summary of a national report, there should be a core message that we want to give every time (current state), and then discuss big changes in:
 - Population (change, region)
 - Gross domestic product (change, region)
 - Fish landings and value (change, region)
 - Coastal uses (change, region)

Appendix C: List of Acronyms Used in the Report

ACE – Army Corps of Engineers
CCAP – Coastal Change Analysis Program
CCMP – Comprehensive conservation and management plan
CICEET – Cooperative Institute for Coastal and Estuarine Environmental Technology
CONUS – Continental United States
CSC – Coastal Services Center
CSO – Coastal States Organization
CWA – Clean Waters Act
DEP – Department of Environmental Protection
DO – Dissolved Oxygen
DOI – Department of the Interior
ENSO – El Niño Southern Oscillation
EPA – Environmental Protection Agency
FEMA – Federal Emergency Management Agency
IOOS – Integrated ocean observing system
JOCI – Joint Ocean Commission Initiative
LIDAR – Light detection and ranging
MPA – Marine protected area
N – Nitrogen
NASA – National Aeronautics and Space Administration
NCCOS – National Centers for Coastal Ocean Science
NCCR – National Coastal Condition Report
NEP – National Estuary Program
NERRS – National Estuarine Research Reserves System
NGO – Non-governmental organization
NMS – National Marine Sanctuaries
NOAA – National Oceanographic and Atmospheric Administration
NOEP – National Ocean Economics Program
NOS – National Ocean Service
NPS – National Park Service
NWI – National Wetlands Inventory
OCRM – Office of Ocean and Coastal Resource Management
ORD – Office of Research and Development
P – Phosphorus
PAR – Photosynthetically active radiation
RTE – Rare, threatened and endangered
SAV – Submerged aquatic vegetation
SFEI – San Francisco Estuary Institute
Si – Silicon
TNC – The Nature Conservancy
TOC – The Ocean Conservancy
USFWS – United States Fish and Wildlife Service
USGS – United States Geological Survey

Appendix D: Index of Workshop Documents Available Online

National Core Coastal Indicators Website Address: <http://coastalindicators.gov/events/welcome.html>

The following documents are available on the National Core Coastal Indicators Workshop Website:

- Workshop Description
- Final Workshop Agenda
- Background Documents
 - A Survey of Chesapeake Bay Watershed Residents: Knowledge, Attitudes Behaviors Towards Chesapeake Bay Watershed Water Quality Issues
 - A Complex Systems Approach to the Value of Ecological Resources
 - Gulf of Maine: Leading Management Issues Survey
 - National Coastal Condition Report II Fact sheet
 - Draft National Coastal Condition Report III: Executive Summary
 - The State of the Nation's Ecosystem
 - Northeast Coastal Indicators Workshop: Meeting Summary
 - California : 1990 – 2000 State Summary of Coastal and Ocean Social and Economic Trends
 - National Park Service Ocean Stewardship 2005-2008 Action Plan
- Workshop Presentations
 - Barb Buckland, Environment Canada. *Canadian Coastal Indicator Developments*
 - Hans Paerl, UNC-CH Institute of Marine Sciences. *Emerging Indicators of Human and Climatically-Induced Change in Coastal Ecosystems*
 - Linwood Pendleton, Coastal Ocean Values Center/National Ocean Economics Program/UCLA. *Economic Indicators of Coastal Ecosystem Health*
 - Richard Kool, Royal Roads University, British Columbia. *Facts, Terror, Norms: A Quick Tale on the Inadvertent Impact of Content on Communications*
 - Federal Agency Presentation. *Use of Indicators by EPA, NPS, NOAA, USFWS*
 - Barry Burgan, EPA, Office of Wetlands, Oceans, and Watersheds. *National Coastal Condition Reports: Partners, Audience, Feedback and Evolution*